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2
3 Household appliance comprising an operating strip
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5 [001] The invention relates to a household appliance for
6 integrating into a sector of a worktop comprising an
7 operating strip containing at least one operating element
8 and having a supporting surface on the lower side thereof
9 for supporting the household appliance on the worktop.
10

11 [002] Known from DE 198 11 372 C2 is a cooking surface with
12 a light-permeable cooking hob made of glass ceramic and with
13 control and display elements. The cooking surface has an
14 operating strip with an operating surface facing an operator
15 and a piezo sensor located below said operating surface
16 which detects any touching of the operating surface and
17 delivers a corresponding signal to the control unit. The
18 operating strip is part of a stainless steel cooking surface
19 frame which encloses the glass ceramic hob in a frame
20 fashion and supports said hob. The cooking surface frame is
21 supported with its bent edge on the top of a worktop on the
22 circumferential side. Between the underside of the cooking
23 surface frame and the worktop a seal surrounds the cooking
24 surface section of the worktop.
25

26 [003] It is the object of the invention to provide a
27 household appliance for integrating into a section of a
28 worktop whose operating strip is supported on the worktop
29 and is manufactured simply and with high dimensional
30 accuracy.
31

32 [004] The object is solved according to the invention by a
33 household appliance having the features of claim 1.

1 According to the characterising part of claim 1, the
2 operating element is essentially produced by forming or
3 milling. Production by forming or milling reduces the risk
4 of the operating strip distorting. The supporting surface of
5 the operating strip can thus simply be constructed as flat,
6 thus ensuring that the supporting surfaces rests flat on the
7 worktop. This type of flat support of the operating element
8 on the worktop is crucial when using piezo elements as
9 operating elements. They can be arranged on an underside of
10 the operating strip and detect an actuating pressure which
11 is exerted on the upper side of the operating strip by a
12 user. The actuating pressure exerted on the operating strip
13 by the user is thus reliably detected by the piezo sensor
14 and is not used to press the operating strip in contact with
15 the worktop.

16
17 [005] Forming is understood as the manufacture of a shaped
18 part from a shapeless starting material (e.g. granules,
19 melt, powder). For this purpose, the shapeless starting
20 material is inserted (e.g. cast or pressed) in a special
21 forming tool in which it is converted to the solid state by
22 solidification or sintering. The shaped part formed in this
23 way is removed from the forming tool. As a result of the
24 manufacturing process, the operating strip largely acquires
25 the necessary shape with high dimensional accuracy, reducing
26 the number of after-treatment steps. Such high dimensional
27 accuracy is particularly advantageous when using piezo
28 sensors. By forming or milling, it is possible to implement
29 technically advantageous profile shapes on the operating
30 strip which are not possible with operating strips
31 manufactured by continuous casting or are only possible with
32 very great effort.

33

1 [006] With regard to the stability it is favourable if the
2 material thickness of the operating strip changes depending
3 on the respective requirements. A very high thermal
4 stability of the operating strip is thus obtained. At the
5 same time, the risk of the operating strip warping is
6 reduced. Likewise, further elements for assembly of the
7 operating strip and its mounting in one piece can be
8 constructed on the operating strip, whereby the effort
9 required for assembly is further reduced. The aforesaid
10 advantages can also be achieved by an operating strip which
11 is substantially fabricated by milling.

12
13 [007] The operating strip can preferably have a plurality of
14 recesses separated from one another on its underside wherein
15 various appliance components are arranged. In this case, the
16 operating strip can be made of a solid semi-finished product
17 having high dimensional stability. Only the recesses
18 required for the appliance components are incorporated in
19 the semi-finished product. As a result, on the one hand, the
20 operating strip can be produced inexpensively. At the same
21 time its stability is enhanced and its design is appealing.

22
23 [008] It is advantageous if at least one mounting recess is
24 constructed on the underside of the operating strip, wherein
25 a housing-side fixing flange is in abutment with the
26 operating strip. The mounting recess simplifies correct
27 positioning of the operating strip with respect to the
28 housing of the household appliance when assembling the
29 household appliance.

30
31 [009] In a particular exemplary embodiment, the housing-side
32 fixing flange is arranged in the mounting recess of the
33 operating strip such that it is staggered in relation to its
34 supporting surface or ends flush with the supporting surface

1 in a sealed manner. The fixing flange is thus recessed in
2 the mounting recess. The overall height of the operating
3 strip is thus not increased by the fixing flange.

4
5 [010] For a compact and rigid design it is preferable if the
6 mounting recess is substantially surrounded by the
7 supporting surface of the operating strip. In this case, the
8 mounting recess of the operating strip can be arranged
9 outside the worktop section on the upper side of the
10 worktop.

11
12 [011] It is advantageous for assembly if one edge of the
13 mounting recess substantially positively defines the
14 housing-side fixing flange. The correct positioning of the
15 housing-side fixing flange with the operating strip can
16 thereby be further simplified.

17
18 [012] In order that the operating strip is held rigidly on
19 the housing of the household appliance, a plug-in recess can
20 be formed on the underside of the operating strip. A
21 corresponding plug-in portion formed on the housing side can
22 be inserted therein during assembly. This plug-in portion
23 serves as a counter-bearing which can receive forces, for
24 example, a torque. The plug-in recess can preferably be
25 constructed inside the mounting recess of the operating
26 strip. In this case, the plug-in portion can be constructed
27 simply from the production engineering point of view
28 directly on the fixing flange, whereby a compact design is
29 achieved. In order to achieve a positive connection between
30 the plug-in portion on the housing side and the plug-in
31 recess of the operating strip, a plastic adapter can be
32 inserted, ensuring a positive connection between the plug-in
33 portion and the operating strip.

[013] For fixing the operating strip on the housing of the household appliance, the housing-side fixing flange can be connected to the mounting recess of the operating strip.

[014] An exemplary embodiment of the invention is explained hereinafter with reference to the appended figures. In the figures:

[015] Figure 1 is a perspective view of a cooking surface inserted in a worktop;

[016] Figure 2 is a side sectional view of part of the cooking surface along the line I-I from Figure 1;

[017] Figure 3 is an exploded view of a section of the cooking surface;

[018] Figure 4 is a side sectional view of part of the cooking surface along the line II-II from Figure 1;

[019] Figure 5 is an operating strip of the cooking surface; and

[020] Figure 6 is a guide element to be inserted in a housing opening of the cooking surface.

[021] Figure 1 shows a cooking surface as a household appliance comprising a glass ceramic plate 1 with four different cooking zones. Suitable heating elements are arranged in a fashion known per se underneath a decorative printing 3 of the cooking zones. The cooking surface is inserted in a section of a worktop 5 and is supported on an upper side of the worktop 5. At its front side facing an operator, the cooking surface is supported on the worktop 5 by means of a control strip 7. On its other sides the cooking surface is supported on the worktop 5 by means of a circumferential edge of the glass ceramic plate 1. The operating strip 7 consists of aluminium and has circular protuberances 11 for actuating the cooking surfaces on its

1 upper side 9. The operating strip 7 can also be part of a
2 closed cooking surface frame which surrounds the glass
3 ceramic plate 1 in a frame fashion.

4
5 [022] The operating strip 7 is constructed as having a
6 wedge-shaped cross-section according to Figure 2. The upper
7 side 9 of the operating strip 7 is slightly curved and
8 inclined towards the worktop 5. This ensures a smooth
9 transition between the worktop 5 and the operating strip 7
10 which is advantageous both visually and for cleaning.

11
12 [023] The cooking surfaces are operated by pressing with the
13 finger on the corresponding protuberance 11 according to
14 Figure 1. This finger pressure is received by a piezo sensor
15 13 located on an underside of the operating strip directly
16 below the protuberance 11, which converts the finger
17 pressure into an electronic signal. According to Figure 2,
18 the piezo sensor 13 is arranged in a recess 15 constructed
19 on the underside of the operating strip 7. A positioning
20 recess 19 for the piezo sensor 13 is incorporated in a
21 bottom 17 of the recess 15 which simplifies the positioning
22 of the piezo sensor 13 in the correct position inside the
23 recess 15. In addition, the wall thickness between the
24 positioning recess 18 and the opposite protuberance 11 is
25 substantially reduced on the upper side to enhance the
26 response sensitivity of the piezo sensor 13. The piezo
27 sensor is firmly cast in the recess 15 using a plastic
28 casting compound 21.

29
30 [024] Likewise a supporting surface 23 is constructed on the
31 underside of the operating strip 7 by which means the
32 cooking surface is supported on the upper side of the work
33 top 5. The piezo sensor 13 is arranged in such a way that
34 it is staggered with respect to the supporting surface 23 in

1 the recess 15 of the operating strip 7. As a result, the
2 operating strip 7 can also be supported in the area of the
3 recess 15 on the worktop 5 without damaging the piezo sensor
4 13. According to Figure 2, the operating strip 7 lies mostly
5 on the upper side of the worktop 1. When pressure is exerted
6 on the protuberance 11, the worktop 1 thus acts as a stable
7 counter-bearing for the operating strip, ensuring that
8 pressure is reliably absorbed by the piezo sensor 13.

9
10 [025] Two angular portions 29 spaced apart from one another
11 are welded on an outer side of the housing 25 by means of
12 their first leg 27 to fix the operating strip 7 on a housing
13 25 of the cooking surface. The housing 25 can consist of one
14 piece or of several separate portions, possibly a housing
15 frame with a bottom cover. The angular portions consist of a
16 steel sheet; one of the angular portions 29 is shown in
17 Figure 3. A second leg 28 bent thereto is bent almost
18 parallel to the glass ceramic plate 1 and has a fixing
19 flange 31. The fixing flange 31 is inserted in the assembled
20 state of the cooking surface in a mounting recess 33 on the
21 underside of the operating strip 7.

22
23 [026] The second leg 28 is not bent at right angles but at a
24 slightly smaller angle than 90° to the first leg 27. As a
25 result, in the assembled state the operating strip 7 with
26 its supporting surface 23 is bent downwards at an angle of
27 inclination α of about 0.5° with respect to the cooking
28 surface shown in Figure 3. The angular portion 29 has
29 sufficient elasticity. This ensures that even in the case of
30 unevenness on the upper side of the worktop, the operating
31 strip 7 reliably rests on the worktop over its entire
32 length.

[027] The mounting recess 33 is surrounded by the supporting surface 23. As shown in Figure 3, a sealing channel 41 is further formed on the underside of the operating strip 7. A sealing strip 43 shown in Figure 4 which extends on the circumferential side over the entire cooking surface is glued in the sealing channel 41. Both the mounting recess 33 and also the recess 15 for the piezo sensors 13 are arranged inside the sealing strip 43. The fixing flange 31 is arranged so that it is recessed in the mounting recess 33 of the operating strip 7. The overall height of the operating strip 7 supported on the worktop 5 is thereby reduced. Inserting the fixing flange 31 into the mounting recesses 33 simply ensures that the operating strip 7 is correctly positioned with respect to the housing 25. For this purpose one edge of the mounting recess 33 substantially positively defines the housing-side fixing flange 31. According to Figure 4, the fixing flange 31 is arranged between the operating strip 7 and the upper side of the work top.

[028] In addition to the fixing flange 31, two plug-in portions 45 are constructed on the second leg 28, these being arranged in one plane with the first leg 27 welded on the housing 25 and thus oriented perpendicular to the glass ceramic plate 1. The fixing flange 31 is arranged between the two plug-in portions 45. In the assembled state of the cooking surface the fixing flange 31 is in flat abutment with a mating surface 47 constructed in the mounting recess 33. The fixing flange 31 can be screwed into a threaded hole 49 by means of a countersunk head screw which is constructed in the mating surface 47. The plug-in portions 45 additionally have a plastic adapter 51 by which means the plug-in portions are inserted positively in a corresponding plug-in recess 53 constructed inside the mounting recess 33. In this way, the plug-in portions 45 constructed

1 perpendicular to the fixing flanges 31 form a counter-
2 bearing which ensures that the operating strip 7 is held
3 rigidly on the housing 25. At the same time, the plug-in
4 portions 45 centre the operating strip during mounting of
5 the operating strip 7 on the housing 25.

6
7 [030] If, as shown in Figure 4, food containers exert a
8 force on the cooking surface in a direction of the arrow F,
9 a torque acts on the fixing flange 31 in the direction of
10 the arrow M. This torque is substantially absorbed by the
11 plug-in portions 45 of the angular sections 25. The
12 operating strip 7 is thus held particularly dimensionally
13 stably and rigidly on the housing 25. According to the
14 invention, the supporting surface 23 of the operating strip
15 7 is only spaced by a narrow mounting gap s of 5 mm for
16 example from the cooking surface housing 25. Thus, the lever
17 arm length allocated to the torque M is accordingly reduced.

18
19 [030] A side edge 55 of the glass ceramic plate 1 is
20 disposed between an overhang 57 of the operating strip 7
21 facing the glass ceramic plate 1 and a supporting flange 59
22 of the housing 25. A seal 61 is arranged between the side
23 edge 55 of the glass ceramic plate 1 and the operating strip
24 7.

25
26 [031] The cooking surface housing 25 is constructed as
27 trough-shaped with elevated side walls 63. At their upper
28 end the side walls 63 have the supporting flange 59 which is
29 bent inwards at right angles. The supporting flange 59 of
30 the side walls 63 is glued to an underside of the glass
31 ceramic plate 1 using a silicone adhesive not shown. With
32 the exception of the front side, the glass ceramic plate 1
33 is supported at its side edge 55 on the upper side of the
34 worktop 5. Located between the glass ceramic plate 1 and the

worktop 5 is the sealing strip 43 disposed on the circumferential side which is guided in the area of the front operating strip 7 in the sealing channel 41.

[032] Figure 5 shows the underside of the operating strip 7 without the cooking surface housing 25 and without piezo sensors 13. The operating strip 7 is made of an extruded profile of aluminium for example. In a further production step the mounting recesses 33 with the recess 15 for the piezo sensors 13 located therebetween are formed in the extruded profile by milling. Treatment of the operating strip 7 by milling allows a high dimensional accuracy whereby the number of after-treatment steps is reduced. Furthermore, the material thickness of the operating strip 7 can be modified with high dimensional accuracy and adapted to the respective requirements. For this reason the risk of the operating strip becoming distorted is reduced substantially.

[033] The electrical signal produced by the piezo sensors 13 are guided via connecting leads 67 to an electronic control device 65 provided inside the housing 25. Figure 2 shows one of the connecting leads 67. The connecting leads 67 are combined to form a cable strand and guided from the casting compound 21 cast in the recess 15. The ends of the connecting leads 67 are connected to a plug 68 shown in Figure 6. This is guided through a housing opening provided in the housing side wall as far as the electronic control device 65 and connected thereto.

[034] Located in the housing opening is a feed-through element 69 shown in detail in Figure 6. The feed-through element 69 is manufactured as a plastic injection moulding having a frame 71 which is inserted in the housing opening.

1 The frame 71 defines a feed-through opening 73 through which
2 the connecting leads 67 protected from the sheet-metal edges
3 of the housing opening are guided to the control device 65.
4 Constructed on an upper strip of the frame 71 is a bearing
5 flange 75 which, when inserted, is in abutment on the inside
6 with the edge of the housing opening. Formed centrally on a
7 lower strip of the frame 71 is a locating lug 77 which
8 locates in the side wall of the housing 25 for fixing the
9 feed-through element 69. Likewise, a flap-like adjusting
10 member 79 is pivotally connected by means of a film hinge to
11 the lower strip of the frame 71. Depending on its pivoting
12 position, the adjusting member 79 can change the cross-
13 section of the feed-through opening 73.

14

15 [035] When inserting the feed-through element 69, its
16 bearing flange 75 is first guided from outside through the
17 housing opening of the housing and brought into abutment
18 with the edge zone of the housing opening on the inside. The
19 locating lug 77 is then pressed into a corresponding
20 locating section of the side wall of the housing.

21

22 [036]

23

24 [037] Figure 6 shows the flap-like adjusting member 79 in
25 the opened position so that the cross-section of the feed-
26 through opening 73 is correspondingly enlarged. As a result,
27 the plug 68 can be simply guided through the feed-through
28 opening 73 as far as the control device 65. The adjusting
29 member 79 is constructed as substantially plate-like and has
30 an offset projection 81 constructed with a groove-like
31 recess 83. Located on the opposite side edges of the
32 adjusting member 79 are locating elements 85 which engage
33 detachably behind the lateral strips of the feed-through
34 frame 71 when the adjusting member 79 is closed. In this

1 position of the adjusting member 79 the cross-section of the
2 feed-through opening is reduced to a small gap formed
3 between the groove-like recess 83 of the adjusting-member
4 projection 81 and the upper frame strip. In this case, the
5 connecting leads 67 are sufficiently fixed by the assembly
6 technique. At the same time, when the adjusting member 79 is
7 closed, access to the connecting leads 67 is made
8 substantially more difficult by the offset projection 81 of
9 the adjusting member since the section of the connecting
10 leads 67 running on the outside of the housing is almost
11 completely shielded by the offset projection 81 of the
12 adjusting member (see Figure 2). The offset projection 81 of
13 the adjusting member 79 also acts as a spacer which
14 maintains a narrow mounting gap s between the housing 25 and
15 the cut-out edge of the worktop 5 after inserting the
16 cooking surface into the section of the worktop 5 according
17 to Figure 4, without the connecting leads 67 being damaged
18 during insertion into the cooking surface.

19
20 [038] According to Figure 5, the recess 15 for the piezo
21 sensors 13 is constructed as a groove shape between the two
22 longitudinal front faces of the operating strip. To enhance
23 the torsional stability of the operating strip 7, its recess
24 15 is surrounded by solid material sections. At the same
25 time, the dimensional stability of the operating strip is
26 enhanced by a front stabilising wall 84 and a rear
27 stabilising wall 85 between which the recess 15 is located.
28 Adjacent to the front stabilising wall 83 of the operating
29 strip 7 is a material section 87 having a wedge-shaped
30 cross-section whereby the dimensional stability is further
31 increased in the front area of the operating strip 7.

32
33 [039] Pivot pins not shown are constructed on one side wall
34 of the housing 25. When the cooking surface is inserted in

1 the section of the worktop, these pivot pins engage in
2 spring elements of mounting strips disposed at the edge of
3 the worktop section. As long as the pivot pins are engaged
4 in the spring elements of the mounting strips, the spring
5 elements of the mounting strips press the cooking surface
6 over the operating strip 7 and the circumferential edge of
7 the glass ceramic plate 1 against the upper side of the
8 worktop 5.

9
10